

ATTACHMENT A

DETAILED GUIDELINE OUTLINE

Planning, design and ecological considerations in process based natural channel design for habitat restoration, including channel configuration, riparian function, sediment transport, hyporheic function and flood plain connectivity. Channel design parameters are addressed, including specific habitats (spawning, rearing, holding, riparian, etc.), habitat forming structures, and off-channel habitats. Note: Page estimates are averages and may vary for specific sections of the document.

1 INTRODUCTION [WDFW]

1.1 Historic Impacts to Watersheds

Discuss impacts and their effects on streams.

1.2 Watershed Restoration vs. Protection

Use material from British Columbia manual at least in part.

2 MITIGATION PLANNING [WDFW]

Pull from Chapter 4 of the Integrated Streambank Protection Guidelines (ISPG).

This section will discuss the three objectives of or situations requiring mitigation.

3 DEVELOPING A WATERSHED RESTORATION PLAN [WDFW OR UNDER WDFW DIRECTION]

This section could be very general and refer to other documents (e.g., Stream Corridor Restoration Principles, Processes, and Practices). This chapter is general background information.

3.1 What is Habitat?

3.2 Defining a Restoration Goal

3.3 Watershed Assessment

Reference Washington State Guidance for Salmon Habitat Assessment

3.3.1 Collecting Available Data

Collecting aerial photos, maps, literature search, hydrologic data, historic land use.

3.3.2 Collecting Field Data

3.3.2.1 Habitat Assessment

Discuss limiting factors to fish production in the watershed.

3.3.2.2 Biological Assessment

3.3.2.3 Physical Assessment

Include proper functioning condition

3.3.2.4 Water Quality Assessment

3.3.2.5 Hydrologic Assessment

3.3.3 Analyzing Data

3.4 *Characterizing the Watershed – Structure and Process*

3.4.1 Existing Reach Condition

Describe an assessment of the reach from a physical view. Refer to the geomorphology and hydrology appendices. (estimated to be 5 pages)

3.4.2 Existing vs. Desired Structure and Functions (reference condition) [Contractor]

Identify salmonid deficiencies through limiting factors analysis. In other words, what is the condition one has to work with? Discuss departure from properly functioning condition. Recognize that limiting factor analysis may be overly species-specific and myopic, as it tends to be a collection of preference conditions as opposed to understanding systemic process. Discuss stream structure and function as well as holistic view of salmonid preferences. (2-4 pages)

3.4.3 Identify Causes of Altered or Impaired Condition [Contractor]

Generally what has happened and what has been the impact to habitat conditions. (5-7 pages). This section will be more specific and detailed than comments in section 1.1. Table or flow chart to describe cause and effect of activities. Illustrate that cause and effect can be a complex situation, that effects may be result of multiple causes, rarely a simple relationship. Use a few examples where an observed effect may be a result of numerous causes. Use braided channel as an example. Be sure to emphasize and include comprehensive coverage of effects of urbanization.

3.4.4 Identify Constraints To Restoration [Contractor]

For example, time, debris, hydrology, confinement, infrastructure. Watershed constraints: urbanization, debris and sediment supply. Natural function constraints as opposed to logistical constraints Address issues such as seasonality, timing for maturation (e.g., vegetation), work windows, salmon recovery. (1 page)

3.5 *Prioritizing Watershed Restoration Goals*

3.5.1 Restoration Sequencing

Discuss work in watershed before stream; treat source, not symptom.

3.5.2 Guiding Principles for Protecting and Restoring Stream Ecosystems

3.6 Short-term and Long-term Effects and Planning

3.7 Developing and Implementing a Watershed-scale Monitoring Plan

Objective is to track progress in meeting restoration goals.

3.7.1 Baseline Monitoring

3.7.2 Implementation Tracking

3.7.3 Effectiveness Monitoring

3.7.4 Watershed Reassessment

4 SELECTING A RESTORATION APPROACH [CONTRACTOR]

No selection methodology will be employed as was done with the ISPG.

4.1 Problem Identification

(2-3 pages for following sections 4.1.1 to 4.1.4 in total)

4.1.1 Define Problem (on site, reach, and watershed scale)

4.1.2 Define Objectives

4.1.3 Identify Stakeholders and Interests

Discuss incorporating stakeholder interests in project objective.

4.1.4 Identify Limitations to Accomplishing a Project

Discuss roadblocks, permitting requirements (generally) and restrictions. Logistical, project-specific hurdles.

4.2 General Approaches

For each general approach listed below, discuss short-term and long-term nature, understanding of longevity of technique, maintenance, and appropriateness. List a few examples of techniques that may achieve the approach. (6-8 pages for following sections 4.2.1 to 4.2.4 in total)

4.2.1 Direct Creation of Specific Habitats

Discuss how may or may not pay attention to process. Discuss how might be most appropriate in a constrained system (such as an urban setting).

4.2.2 Process Oriented Habitat Development

Encourage natural creation of habitat through natural disturbance processes and fluvial function. Fluvial function may operate on a site-basis, through a specific structure which encourages process (such as scour or deposition), or on a reach basis through natural disturbance (channel migration, erosion, etc.)

4.2.3 Manage Inputs to a Channel

Discuss direct feeding of materials, including gravel and wood, into a channel without specialized placement.

4.2.4 Replication of Natural Conditions

Does not require understanding of process. This can be seen as one way of achieving each of the previous three general approaches. Results can be good or disastrous depending on whether or not the item copied was appropriate for the site and applied correctly. Highlight its shortcomings when used without consideration of process and its benefits when used in conjunction with a process-oriented approach.

4.3 *Factors to Consider in Identifying and Selecting an Approach*

(3-4 pages for following sections in total)

4.3.1 Resultant Conditions

Discuss result as “natural” conditions relative to current conditions, and the limitations to achieving natural conditions.

4.3.2 Delay to Results

Discuss amount of time before results are realized.

4.3.3 Longevity of Project

Anticipated design life of project

4.3.4 Operations and Maintenance Needs

Discuss short- and long-term operational or maintenance needs.

4.3.5 Environmental Impact

Discuss impacts to resources – aquatic, riparian, terrestrial, marine

4.3.6 Risk Assessment/Certainty of Success

Risk of not achieving desired outcome and risk of causing damage to resource. Risk is considered relative to natural resource.

4.3.7 Cost Effectiveness

Cost effectiveness relative to other alternatives, assuming all alternatives considered achieve desired outcome.

4.4 *Process for Selecting Techniques [WDFW]*

Couple pages plus a table. Table - List the desired results in a table and the techniques that can be used to address the problem. No new information, just a summary.

4.5 *Design Criteria*

(2-3 pages for following sections in total)

4.5.1 What are Design Criteria?

Describe design criteria and how they relate to objectives.

4.5.2 Examples of Design Criteria

4.5.3 How Design Criteria Relate to Monitoring

Speak generally about what they are, why they are important, how they relate to objectives, design and monitoring.

5 DESIGNING AND IMPLEMENTING STREAM RESTORATION PROJECTS [CONTRACTOR]

This outline will generally apply to each restoration technique but may vary among techniques.

5.1 Introduction

5.1.1 Description of Technique

5.1.2 Physical and Biological Effects

Discuss the scientific basis for use of the technique and what are the biological effects. This refers to impacts and results.

5.1.3 Application of Technique

Discuss location, channel type, limitations; where it fits and where it doesn't fit – tie it to channel processes and reach considerations.

5.2 Scale

Discuss how this technique can range in terms of scale, and whether additional specialized expertise (such as a licensed engineer) may be required (or at least advised).

5.3 Risk and Uncertainty

Risk of project not meeting objective, risk to other habitats, risk to infrastructure

5.4 Data Collection and Assessment

This should include identifying potential reference reaches. Discuss other data that may be collected for empirical and analytical design approaches.

5.5 Methods and Design

How is the design approached?

5.6 Project Implementation

5.6.1 Permitting

5.6.2 Construction

Include needs for care of water, timing, in-water work, vegetation, type of equipment.

5.6.3 Cost Estimation

Range of costs per unit, cite case examples with total project costs.

5.6.4 Monitoring and Tracking

What parameters should be monitored to address success of project and risks.

5.6.5 Contracting Considerations

Discuss aspects that may not be typical for contractors, or where specialty contractors may need to be utilized.

5.7 *Operations and Maintenance*

Discuss operations and maintenance needs, timing, frequency.

5.8 *Examples*

Description of example, with locations, sketches and photos.

5.9 *References*

References cited in this technique so it is a stand-alone pullout.

5.10 *Techniques*

The [Low], [Moderate], and [High] qualifiers on the techniques below indicate the expected *average* level of detail and work required. The level of effort is intended to reflect new work and will often supplement work previously done for ISPG. Make sure that techniques are consistent with ISPG techniques – do not create new variations from those presented in ISPG

[Low] 1 page – may be presented as a technique or just described and referred from the text to other documents.

[Moderate] 4 pages plus 2 sketches and 1 photo average

[High] 8 pages plus 3 sketches and 2 photos average

5.10.1 Channel Planform Restoration [Mod]

- a. Include direct restoration (construct channel) and incremental process (build log jam that will tend to create islands that will restore natural divided channel rather than braided channel)
- b. For all habitats
- c. Supplement ISPG

5.10.2 Channel Cross-section Restoration - [High]

- a. Include direct and incremental process as described above. Describe relationship to sediment transport. How do you size and configure a new channel?
- b. Includes reconnection by excavating floodplain down to channel.
- c. Also includes overwidened streams narrowed back to proper width. Overwidened due to dredging or grazing.
- d. For all habitats.

- e. Supplement ISPG.

5.10.3 Channel Profile Restoration - [Mod to High]

- a. Includes raising the channel profile towards its floodplain. But it would also include the more general discussion of bedform diversity and items needed to be considered when reconstructing a channel. When are bed controls recommended? How do you select a bed elevation (e.g., coincide with buried stream gravels found on site, if applicable)? What techniques are recommended if the new channel is a different gradient than the natural channel (e.g. larger stream gravels, bed control, higher roughness)?

5.10.4 Levee Removal and setback - [High]

- a. Principles are supported by Cross-section Restoration.
- b. Includes effect of levee removal that has been in place for decades and the channel has tried to evolve to it. Include how the floodplain is treated, risks of simple removal, and sequence of floodplain and channel restoration. Address the potential for detrimental effects of levee removal. Address how far back a levee has to go?
- c. For all habitats.

5.10.5 Debris Jams - [Moderate]

- a. A process technique is a structure that restores a natural process though it may be done with a material that isn't natural. It isn't necessarily restoring full process. It could be something like building an artificial log jam that will restore natural functions and processes of roughness, scour, bed sorting, etc. Make the point that structures should only be used in the context of process design.
- b. Include full jams and debris catches.
- c. Supplement ISPG.
- d. For rearing, holding and spawning.

5.10.6 Log cover - [Moderate]

- a. This is a simple log laid on the bank and crossing over a side scour pool as cover and flood refuge or a log buried in the bank cantilevered into the channel.
- b. For rearing and holding habitats.

5.10.7 Boulders – [Moderate]

- a. Single and clusters.
- b. For rearing, holding and spawning (sorting and stability of bed material) habitat.

5.10.8 Structures to Maintain Bed and Bank Scour - [Moderate]

- a. Create scour for rearing, holding and spawning (sorting and stability of bed material) habitat.
- b. Supplement info on groins and barbs in ISPG, but clarify difference in objectives (protection vs. creation through scour).
- c. To create and maintain diverse bedform and thalweg.
- d. To encourage gravel deposition/stabilization/sorting.
- e. Include rock piles, groins, deflectors, digger log, debris jams (detailed elsewhere)

5.10.9 Channel Constriction - [Moderate]

- a. For rearing, holding and spawning (sorting and stability of bed material) habitat.
- b. This technique may be folded into Structures to Maintain Bed and Bank Scour

5.10.10 Spawning Pad - [High]

- a. Bed retention sills and pads.
- b. For spawning, holding and rearing.
- c. May include spawning material placement .
- d. Culvert fish passage guideline includes good design and sketch of single log sill. Need to add “vee” weir sketch.
- e. Pads in channels with spring water hydrology or in channels with appropriate hydraulics but depleted of gravel.

5.10.11 Spawning Gravel Cleaning and Loosening - [Moderate]

- a. e.g.; Gravel Gertie.

5.10.12 Side channel habitats – [Moderate]

- a. Connection, construction and protection of ground and surface water fed side channels.
- b. Include opening floodgates, debris jams to meter flow into side channels.
- c. Supplement ISPG.

5.10.13 Riparian Management – [Moderate]

- a. To create cover, stabilize banks, improve water quality, shade out in-channel reed canary grass, provide long-term source of woody material).
- b. Include discussion of ecological values of riparian habitat.
- c. Include specific techniques such as grazing control and livestock watering. Refer to other documents (e.g. BLM, NRCS) for details.
- d. Refer to WDFW PHS Riparian document and Planting and Erosion Control Appendix of ISPG.

5.10.14 Flow Management – [Low] [WDFW]

- a. Stormwater management, water diversions, and in-stream flow.
- b. Refer to other documents. For stormwater, refer to WA Dept of Ecology’s Stormwater Manual. For water diversions, appropriate documents will need to be located. The USDA Natural Resources Conservation Service is the most likely place to lead people for BMPs and irrigation systems that reduce landowner’s use of water as well as efficient canal design. For instream flow, there are several documents on the WA Dept of Ecology’s web site. The primary one of interest is called “In-stream flow study guidelines” and was written jointly between WA Dept of Ecology and WA Dept of Fish and Wildlife.
- c. Flow management (e.g. instream flow, stormwater management) is primarily a planning technique and will be written more for the benefit of planners than project sponsors.

5.10.15 Groundwater Recharge (include hyporheic conditions) - [Moderate]

- a. Upwelling, downwelling, spring-fed side channels, flow depletion to hyporheic zone, and groundwater nutrient cycling all directly affect habitat. There's not much we can usually do about it but it shouldn't be lost. Where it also fits is in the description of watershed and function. Projects should be sited and designed with hyporheic conditions, opportunities, and limitations in mind. Include a few sketches showing losing vs. gaining, etc. to describe concepts. This section assumes that some research to determine current understanding of hyporheic flow as it relates to channel design will have to be done.
- b. This may be primarily a land use and planning issue.

5.10.16 Fish Passage Restoration – [Low]

- a. Refer to Fish Passage at Road Culverts and Fishway Design manuals

5.10.17 Water Quality Improvements - [Low] [WDFW]

- a. Refer to other documents. A key to this effort is to not reinvent existing work that is adequate. We don't expect to provide technical information here or to paraphrase. We expect to describe the value of stormwater management for habitat restoration and to say for example, "no guidance is provided in these guidelines for stormwater management, refer to the current version of the Ecology Stormwater Manual for guidance."
- b. Point and non-point source pollution management. References will need to be determined. The WA Dept of Ecology's Stormwater Manual will provide some of this with regards to urban BMPs. The USDA Natural Resources Conservation Service will be a reference for agricultural BMPs.
- c. Stormwater management. Refer to WA Dept of Ecology's Stormwater Manual.
- d. Describe the value in habitat restoration.
- e. Refer to other documents.
- f. This may be primarily a land use and planning issue.

5.10.18 Sediment Control – [Low] [WDFW]

- a. Road decommissioning, land use practice modification, riparian zone restoration, stormwater management, upland sediment detention basins, restrict livestock access, and road cleaning.
- b. General discussion; refer to other documents. The WA Dept of Natural Resources Forest Practice Act will be a reference for road decommissioning and BMPs related to logging operations. The USDA Natural Resources Conservation Service will be the most likely reference for upland sediment detention basins, restricting livestock access, and agricultural BMPs to reduce upland erosion. The WA Dept of Ecology's Stormwater Manual may provide urban BMPs for sediment control.
- c. This may be primarily a land use and planning issue.

5.10.19 Land Preservation, Buy-back and Floodproofing - [Low]

- a. These techniques allow the river to continue functioning. Don't describe the "how to do

it,” just mention the opportunity. They may also be used in conjunction with something like floodplain reconnection as an overall restoration effort.

- b. This may be primarily a land use and planning issue.

5.10.20 Bank Protection – [Low]

- a. Refer to ISPG.
- b. Primarily describe when bank protection can legitimately be considered restoration.

5.10.21 Gravel Nourishment – [Mod]

- a. Place gravel on bank or bar to be scoured as gravel source.

5.10.22 Nutrient Replacement – [Low] [WDFW]

- a. Salmon carcasses.
- b. Refer to WDFW carcass policy.

5.10.23 Woody Debris Replenishment – [Moderate]

- a. Bring it to the stream and let the river put it where it wants.

5.10.24 In-stream Sediment Detention Basins – [Low]

- a. Supplement ideas from Sand and Gravel Mining document white paper. This will be a technique in that guideline.

5.10.25 In-stream Reed Canary Grass Removal - [Low]

- a. Dredging, herbicides, shading

TECHNICAL APPENDICES [CONTRACTOR]

The intention will be to build on the appendices prepared for the ISPG so that they can be used for both, rather than having different appendices of the same name. Appendices will serve the purpose of providing technical information and explanation of various aspects of design and act as a reference source for practitioners. Where ISPG appendices are sufficient as they already exist, these appendices may require little or no effort or modification. Numbers of pages listed are the equivalent of new work for this contract.

Hydrology (2 pages)

Fluvial Geomorphology (2 pages)

Sediment Transport (2 pages)

Hydraulics (2 pages)

Riparian Vegetation (2 pages – supplements riparian management technique)

Aquatic Habitat (4 pages) [WDFW]

